

The Paradox of the Traveling Embolus Reaching the Patent Foramen Ovale; which Side to go?

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Abstract

Impending paradoxical embolism is a rare condition that requires emergency treatment because of its high morbidity and mortality. We report a case of an impending paradoxical embolism that was detected in a patient without signs of stroke or pulmonary embolism, and was noticed in a preoperative evaluation, deep venous thrombosis was investigated and detected soon after.

Treatment options for impending paradoxical embolism include anticoagulation, thrombolysis, and surgery however since the patient didn't have any neurological deficits and surgical therapy has shown a trend toward improved survival. Surgery was decided and clots were removed from the cardiac chambers. The patient underwent full recovery, however, the question still remains in which surgical approach would be best.

Keywords: *Impending Paradoxical Embolism; Patent Foramen Ovale; Interatrial Communication*

Abbreviations

PFO: Patent Foramen Ovale

Introduction

Impending paradoxical embolism is a rare cardiac condition with high mortality [1], it appears usually as a complication of deep venous thrombosis and an interatrial communication [2,3]. The clot migrates to the heart, and if it is sufficiently large it becomes entrapped in an interatrial communication, usually a patent foramen ovale. (PFO) Treatment of impending paradoxical embolism is still controversial. We present a case of an 81-year-old patient with impending paradoxical embolism that was detected by a preoperative evaluation. Surgery was decided and he underwent full recovery, however, the best surgical approach for this kind of pathology isn't defined.

Case Report

Patient is an 81-year-old male, with past medical history of hypertension. He had a transurethral prostate resection and presented to the emergency room with urinary retention soon after the removal of the Foley catheter. A new Foley was placed, and gross hematuria was seen through the catheter. Urologist consultation was requested and a cystoscopy was planned. Preoperative evaluation was done.

During the evaluation, an atrial fibrillation was detected, so a transthoracic echocardiogram was performed. Two blood clots were revealed, one of approximately 6 cm at the level of the right atrium and another of 4 cm in the left atrium communicating through a PFO.

Because of this (Figure 1A and supplementary Video) a Doppler ultrasonography of lower limbs was done and it identified a left popliteal vein thrombosis (Figure 1B and supplementary video). Tomography didn't show pulmonary embolism.

A cardiothoracic assessment was required and surgical treatment was planned soon after an inferior vena cava filter (Figure 1C and supplementary video) was placed and anticoagulation was initiated.

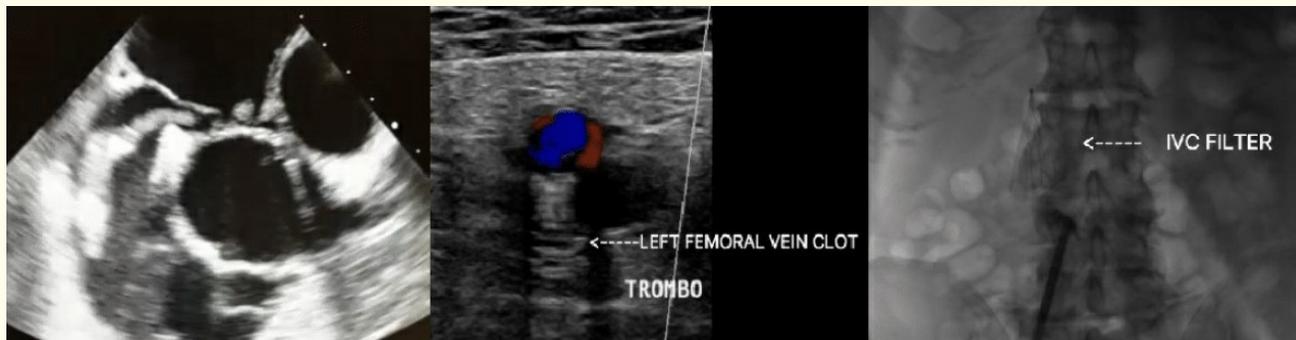


Figure 1: A: Echocardiogram revealing two blood clots communicating through a patent foramen ovale, B: Doppler ultrasonography of lower limbs was revealing vein thrombosis, C: Inferior Vena Cava Filter in place.

Following a sternotomy and cardiopulmonary bypass, a right atriotomy was performed, a 10 x 1 cm clot was found in the right atrium (Figure 2A and supplementary video) that communicated with a 4 x 0.5 cm clot in the left atrium. (Figure 2B and supplementary video) The PFO had a 1.5 x 0.5 cm defect. Surgical removal of the right clot was performed, and the left clot was removed through the PFO. (Figure 2C) The interatrial communication was enlarged and after an exhaustive exploration and irrigation of the left atrium, no other clots were visualized. After this, closure of the PFO was performed, and the remainder of the procedure continued without any complications.



Figure 2: A: 10 x 1 cm clot in the right atrium, B: 4 x 0.5 cm clot in the left atrium, C: Removal of the right and left atrial clots through the PFO.

Supplementary Video

Atrial fibrillation recurred in the early postoperative period and was controlled with amiodarone. On the second postoperative day, a 20-second seizure was identified and controlled with anticonvulsive agents. Encephalogram was normal and a cranial tomography didn't find any cerebral embolism, the patient didn't have any neurological deficits during his hospitalization.

Hematuria was seen during the first days of hospitalization however it didn't have any clinical repercussion and resolved before discharge. The patient underwent full recovery.

Discussion

Paradoxical embolism was first defined by Cohnheim in 1877, as a complication of deep venous thrombosis and an intracardiac shunt which causes arterial embolism, it was usually a postmortem diagnosis, because of its high mortality [1]. If the clot is sufficiently large it becomes entrapped in an interatrial communication, usually a patent foramen ovale, and it's referred as an impending paradoxical embolism [3]. It was first described thanks to echocardiography in 1985 [2].

It's a rare condition with few cases reported in the literature [2,3]. Most patients have pulmonary embolism symptoms 91%, stroke or peripheral vascular ischemia 55%, clinical evident deep vein thrombosis is seen in about 22% [1,4]. Shock, hemodynamic collapse, and coma are other forms of presentation that are usually seen in non-survivors [3]. Our patient didn't have any cardiac symptoms and the clot was noticed in a preoperative evaluation for cystoscopy; soon after, deep vein thrombosis was also detected.

To allow the embolus to migrate from the right to the left atrium, a right-to-left pressure gradient is needed or a Valsalva maneuver, allowing the thrombus to migrate from right to the left atrium [5], our patient had urinary retention that could have caused Valsalva maneuvers and the development of impending embolism.

Echocardiography is usually essential for the diagnosis of impending paradoxical embolism, however, the clot may not be visualized well or at all [3], in our patient transthoracic echocardiography was diagnostic.

Impending paradoxical embolism requires emergency treatment, although the best treatment is still controversial, and depends mostly on the clinical condition of the patient [1,3,6]. Most authors recommend a surgical removal and closure of the interatrial communication since the risk of systemic embolization is high [8]. Mortality is about 15% in those who receive surgical treatment compared to those clinically treated 50% [4], however this group of patients are usually in critical condition [7].

After diagnosis, management of our patient was straightforward, he was given heparin, and due to the association with deep venous thrombosis, an inferior vena cava filter was placed to prevent more clots to migrate to the right atrium. From there he underwent surgery and complete removal of the clots from the right atrium across the patent foramen ovale into the left atrium, then the PFO was closed. Patient developed a 20-second seizure in his early postoperative period. Stroke was suspected, and thankfully, all the test and clinical course of the patient didn't show neurological deficits.

On follow up controls, long life anticoagulation with warfarin was prescribed and patient remained free of thromboembolic events.

Since treatment of impending paradoxical embolism is still controversial, the best surgical approach hasn't been defined, should we have approached it from the right atrium as we did, or should we have approached it through the left atrium to identify clots that could have been missed.

Conclusions

Despite the lack of definitive treatment for impending paradoxical embolism. It is an emergency and therapy needs to be instituted promptly as morbidity and mortality are high. Surgery appears as the best option, however, the approach to prevent migrating embolus

during this kind surgery hasn't been defined yet. Close follow up after surgical procedures are critical for the benefit of our patients and in our development as surgeons.

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